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REPORT AND RECOMMENDATIONS
of the
HORTICULTURAL CROPS RESEARCH ADVISORY COMMITTEE

CURRENT SERIAL RECORDS

Developed at its Second Meeting
February 1-5, 1965
San Francisco, California

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Additional copies of this report may be obtained from the Executive
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P r e f a c e

The second meeting of the Horticultural Crops Research Advisory Committee was held in San Francisco, Albany, and Davis, California, on February 1-5, 1965, with 16 of the 19 members present. Dr. Cintron, Mr. Faye, and Dr. Oyler were unable to attend. Mr. D. F. McMillen, Director of Administration, Sunkist Growers, attended as a representative of the National Agricultural Research Advisory Committee. Dr. Nyle C. Brady, Director of Science and Education, Office of the Secretary, USDA, served as Chairman of the Committee. Dr. Omer W. Herrmann, Deputy Administrator for Marketing Research, Agricultural Research Service, served as Vice Chairman.

The Committee made a systematic review of the Department's research program on horticultural crops as contained in the December 31, 1964, progress reports on Citrus and Subtropical Fruit; Deciduous Fruit and Tree Nuts; Florist, Nursery and Shade Trees; Potatoes; and Vegetables. This was supplemented by a presentation of administrative and budgetary developments; a tour of selected laboratories of the Western Utilization Research and Development Division at Albany; and discussions by USDA staff members of current and projected programs of Farm Research, Economic and Marketing Research, and Nutrition, Consumer and Industrial Use Research. The Committee spent one full day in a visit to the University of California at Davis, where research projects related to interests of the Committee were visited and discussed by University staff members.

The Committee also considered oral and written statements of research needs submitted by: the Appalachian Area York Spot Committee, the Stone Fruit Marketing Committee, the California-Arizona Citrus Industry, the Society of American Florists, and the Wine Institute.

After careful review of the information available, and based upon current and future need for new knowledge and the seriousness of problems faced by the industry, the Committee made the following comments and recommendations.

I. GENERAL COMMENTS AND RECOMMENDATIONS

Public Appreciation of Agricultural Research. Nowhere in the economy of our Nation have the benefits of Federal research and development yielded greater returns to all of our people than from the work of the United States Department of Agriculture. We believe it is important that constant publicity and emphasis of this fact be made.

Farmers are fewer in numbers, but the importance of what they accomplish in the total economy does not diminish. Our Committee urges that the Department give more emphasis to publicity of the benefits derived by our people from agricultural research and development. The stories--dramatic and prosaic--must be told over and over and over again.

Very few urban citizens realize the high standard of living available to all of us because of the great abundance of low-cost, high-quality foods and fibers. Agricultural research at all levels, especially through the United States Department of Agriculture, has contributed no small measure to this. Nowhere in any nation can such dramatic and thrilling results be shown as here. It is the duty of all of us to tell this story.

Location of Agricultural Research. The Committee views with general favor the centralization of agricultural research in modern, well-integrated laboratories with complete library services and, where possible, in an academic surrounding. However, there exist important problems in production, utilization, and marketing research where useful answers can be obtained only under field conditions. Response of horticultural crops to geographic areas and climatic conditions is such that the development of suitable varieties and agronomic practices can only be learned in the area where the crops are to be grown commercially. In view of the increasing importance of processing to preserve and distribute foods, it is essential that all genetic and production research in fruit and vegetable crops be coordinated with utilization and marketing research to evaluate suitability for processing and development of improved processing methods for fruits and vegetables. The Committee views with favor the recent establishment, supported by industry, the States of Minnesota and North Dakota, and the United States Department of Agriculture, of a coordinated research program on the production, marketing, and processing of potatoes at East Grand Forks, Minnesota. Furthermore, it urges the United States Department of Agriculture and the Agricultural Experiment Stations to consider the establishment of similar stations for other fruits and vegetables at suitable locations throughout the United States. The Committee deplores the withdrawal of processing evaluations from experiment stations where genetic and agronomic researches are important enough to continue.

Team Work in Agricultural Research. In the application of scientific knowledge to the solution of problems of agriculture, teamwork among research men of various scientific disciplines and from various administrative agencies will get the job done fastest and at the least cost. In particular, horticulturalists, plant pathologists, food technologists, chemists, engineers, and nutritionists, representing both the United States Department of Agriculture and the State agricultural experiment stations, must work together in problems of improving the production of raw material, developing better processed products, and assuring the most value to the consumer. This Committee recommends strengthening of efforts being spent to guarantee maximum teamwork in agricultural research.

Training and Scientific Environment of Research Personnel. The Committee endorses implementation of the recommendations made by the Task Force which recently studied the training and scientific environment of the Department research personnel. A high-caliber, up-to-date research staff, working in the proper environment for maximum creative stimulation, supplied with adequate facilities and equipment, is an essential prerequisite to a productive research program.

Restrictive Personnel Ceilings. The Committee is concerned about the restrictive personnel ceilings placed upon research agencies in the Department of Agriculture. We believe these restrictions are not practical. They are hampering vital work and help contribute to inefficient use of funds. In addition, they are diminishing the number of qualified persons who consider a career in the Department.

Mechanization Research. The need for mechanical substitutes for human labor has been intensified by the termination of Public Law 78. Time is a critical factor in this case, if we are to maintain the flow of high-quality, adequate food supplies for our Nation and the world. There is an urgent need to expand research and development of practical devices to plant, grow, harvest, transport, process, package, and deliver every type of horticultural crop. Furthermore, it is important that increased emphasis be placed on the development of vegetables through plant breeding that are adaptable to mechanical harvesting equipment.

Effects of Air Pollutants on Yield and Quality of Horticultural Crops. Cooperative research conducted by the Air Pollution Research Center of the University of California at Riverside has shown that industrial and auto exhaust air pollutants are producing serious crop damage in the Los Angeles Basin. Air pollution is now recognized as a rapidly growing national problem with crop damage occurring in many valuable farming areas surrounding centers of rapid industrialization and urbanization. The U. S. Department of Agriculture is urged to continue and expand its participation and support of research on the causes and control of air pollution damage to crops at Riverside and other research centers through every available means.

Disposal of Food Processing and Other Agricultural Wastes. The highly critical and growing problem of disposal of food processing and other agricultural wastes demands immediate attention. We recommend that the Department of Health, Education, and Welfare, in its assigned responsibility in the area of air, soil, and water pollution, utilize information already developed by the United States Department of Agriculture's utilization research divisions and other agencies so that solutions may be found that will permit the food processing industry of this Nation to continue to supply high-quality products at minimum prices for the consuming public. Waste disposal problems should be considered in the development of new products and processes. Data on amounts and kinds of byproducts in wastes involved and specific suggestions for handling them should be available upon release of information on new and improved processing methods developed by USDA research divisions.

Naming New Varieties of Fruits and Vegetables. Because of keen competition in today's market place, it is increasingly important that new variety introductions be named with the problems of future advertising and promotion in mind. This is especially true for the introduction of new varieties of fruits. A variety name which does not reflect the quality or desirable characteristics of the commodity, or relate the new introduction to an accepted variety it supersedes, does not enhance its promotability.

Starling Control. The economic loss to the orchard industry due to starlings is becoming of serious consequence. Attempts in various areas to control the population by trapping or poisoning are not satisfactory or long-term answers to the basic problem. Local industries have invested large sums, but the starling population increase affects large segments of agriculture throughout the country. Control or eradication research is much in need.

Assistant Secretary for Science and Education. The Committee reaffirms its recommendation of last year that an Assistant Secretary of Agriculture for Science and Education be established. It wishes to commend the USDA for its attitudes and the general direction the Department is following to enhance agricultural research as set forth by Dr. Nyle C. Brady, Director of Science and Education, in his remarks to the Committee. The prestige of research on agricultural problems would be materially improved by the recognition accompanying an assistant secretaryship having responsibility in this area, the Committee believes.

Use of P. L. 480 Funds for Research. The Committee commends the Department for the current program of research in foreign countries, utilizing funds made available under Public Law 480. It recommends the continuation and expansion of studies of U. S. agricultural products in foreign markets with these resources. The Committee requests that a report of the results to date of all studies abroad relating to horticultural crops be prepared and submitted to the Committee prior to or at its next meeting.

Increased Support for Agricultural Research. Because of the importance of the research carried on by the United States Department of Agriculture to the whole Nation and to the world, we encourage greater emphasis be made in the field of research and development.

As our Nation and its economy grow, the needs for expanded research grow. This means increased funds for intelligent, coordinated work. Dramatic breakthroughs are constantly being made. The results are evident in medicine, health, recreation, science, industry--in fact, every facet of our economy. Results like these are possible only by the use of the best, most dedicated scientists, and adequate, up-to-date equipment, in modern, efficient laboratories.

Because agricultural research is one of the frontiers of our national security and so important to the health, welfare, and interest of the free people of the world, the Committee recommends that Members of Congress, the Secretary of Agriculture, and the President of the United States be urged to give their support for continued and expanded research

II. COMMENTS AND RECOMMENDATIONS ON CURRENT PROGRAM AND NEEDED RESEARCH

In recommending new or expanded research on problems listed in this section, the Committee recognizes that it is not its responsibility to delineate between research to be conducted within the Department and that to be conducted in cooperation with State Agricultural Experiment Stations and other research organizations. The recommendations made by the Committee are based on their judgment that the problems are important and that research is needed by the Department on them. The Committee did not establish any priorities as to importance of problems recommended.

FARM RESEARCH

Plant Breeding. Plant breeders have created remarkable advances in horticultural varieties. Without their contribution, our horticultural industries would be far different and less important. Mechanization and processing are changing our systems swiftly. Consumer habits of eating and living are very different from what they were 10 years ago. We urge breeders to enlist the opinions and suggestions of growers, harvesters, processors, and consumers as they set up variety objectives.

We recommend implementation of the recommendations on the breeding of improved varieties of horticultural crops made by the Committee at its last meeting. Specific problems included the following:

We recommend that "stunt" diseases of corn be investigated; that causes be determined and that the problem be acted upon when identified.

We recommend that continued research on onions include further development of slow-bolting, high solids, processing types of white varieties and hybrids.

We recommend that additional and new research be implemented to develop new varieties of tomatoes and melons suitable to mechanical harvest.

Expanded research is needed for the development of ornamental plant material that conforms better to the small home, that can be used for highway or street beautification, that can be planted as a ground cover for excavation protection. Plants tolerant to "smog" conditions and ornamental plants tolerant of salt water spray are also needed. Investigations on herbicides and soil residues are requested for nursery practices.

The Committee urges the Department to give high priority to the need for additional staff and improvements to the facilities and the equipment in the Ornamental Plant Section at Beltsville, Maryland, and at Delaware, Ohio. The industry is suffering from the lack of research at these stations due to inadequate personnel and antiquated facilities.

We recommend that the sorghum breeding program scheduled to be discontinued at Meridian, Mississippi, should be continued.

Virus Diseases. It is becoming increasingly clear that virus diseases of tree fruits and nuts are among the most destructive diseases afflicting these industries. So far, little progress has been made in devising methods of curing the disease in a tree, once it becomes infected. Fruit and nut growers must rely on avoidance procedures. It is recommended that consideration be given to establishing a pioneering laboratory or other specialized research group dedicated to basic research on the mechanism of virus disease damage to trees which hopefully would lead to chemical or other means for curing infested trees.

Stubborn Disease of Citrus. Recent evidence makes it clear that "stubborn disease," long-known to be a virus disease transmitted by vegetative inoculation is several-fold more prevalent in plantings established in California and Arizona during the past 6 to 8 years than in older bearing plantings. This alarming increase in stubborn disease in new plantings suggests that a vector is causing natural spread, or that the virus is becoming established in new rootstocks or grafts. If efficient methods of identification and control are not developed soon, very severe losses will be caused. So far, no important variety or rootstock has shown any appreciable tolerance to the disease. It is recommended that research on stubborn disease be accelerated to insure the rapid development of reliable means of identification and control or avoidance. It is suggested that the addition of approximately \$25,000 to the continuing budget of the U. S. Field Station at Indio, California, would provide the additional subprofessional help and related support needed.

Internal Disorders of Italian-type Prunes. The northwest Italian prune industry has suffered from an assortment of physiological disorders affecting the internal condition of the fruit. These disorders have occurred in a non-traceable pattern for over a quarter of a century and have eluded researchers in several locations in a number of different investigations. The prune industry faces severe economic loss because of a marketing shift from processing to fresh utilization as complicated by the internal browning.

A breeding research program is requested, with the intent of eliminating these undesirable internal disorders, while maintaining the other high qualities of the Italian-type prune.

Softening of Brined Cherries. A mysterious malady affecting the texture of cherries during the brining process is creating extensive hardship for the Pacific Coast cherry industry. Research on this problem is being financed by the Washington State Fruit Commission and by USDA funds expended at the WURDD at Albany, California. The continued investigation of this problem is necessitated by its importance to the fruit industry.

Bacterial Blight. During the past 4 years, bacterial diseases of horticultural crops have become more prominent than ever with highly significant losses occurring in beans, cucumbers, peas, peppers, tomatoes, pears, apples, and other crops. Since there has been very little concerted effort on the control of bacterial disease of horticultural crops, it is recommended that a sound basic research program be initiated on bacterial diseases. Information is needed on distribution, detection, survival in the plant and in the soil, pathogenesis, ecology, transmission, and the control.

Investigations on detection should include the use of serology, histochemistry, fluorescence microscopy, and bacteriophages. Control methods should include the use of cultural, chemical, and biological devices, including the use of bacteriophages and the development of disease resistant varieties.

Bacterial Blight of Beans. Bacterial blight of beans has become of major concern in all bean producing areas east of the Rocky Mountains. It has been especially severe in the bean producing areas of Wisconsin, Michigan, New York, Idaho, Oregon, and Nebraska. The infestations are not limited to one particular organism but include the halo blight and common blight organisms as well. The specific organism causing halo blight has been present for the past 2 years in the bean producing areas of Idaho where most of the Nation's snap and canning bean seed is produced. This infection has resulted in tremendous losses to farmer-growers and seed companies as well as to canners and freezers in the areas where the beans are grown for processing.

A crash program is needed immediately to develop techniques for identifying and controlling the bacterial blight organisms in and on the seed and plant. It is suggested that this study be sufficiently broad in scope to encompass all aspects of the organisms so that similar methods of investigation may be applied to other harmful bacterial pathogens. It is further suggested that this study establish short- and long-range objectives; that short-range objectives include: (1) methods for elimination of seed infection; (2) methods for identifying the organisms in minute quantities; (3) methods of field control (soil, plants, insects); and (4) development of disease-resistant varieties suitable for processing. The long-run investigations should include the necessary basic research to eliminate the organism.

Potato Scab. Expanded research is needed immediately to investigate and solve problems related to a new and virulent strain which may become a serious problem to the industry.

Verticillium Wilt of Potatoes. New and expanded research is recommended on Verticillium wilt. It is recognized that limited control can be obtained by a long rotation. However, this method of control is not economically practical in areas of intense land use or in areas with special cropping schedules. Also, a microsclerotial strain of a resistant form of Verticillium is developing that is not as easily controlled by rotations and weather.

There is a need for better seed treatments, greater emphasis on the development of resistant varieties, more research on biological and systemic control, and more basic information on the development and control of Verticillium wilt.

Growth Regulators. The potential of growth-regulating chemicals is very important to the future of the horticultural crops industries. These regulators must be more thoroughly investigated as to both short and long-term effects on the tree, fruit, and soil. A basic understanding of how and why they affect growth is vital to their full utilization by industry. Other reactions and uses should be investigated, including chemically induced winter hardiness, delayed blooming in the spring, flower-bud development, and increased and decreased growth rates.

Weed Control. The control of annual and perennial weeds in horticultural crops has received inadequate attention in research programs. Increasing difficulties in securing labor, in getting herbicides cleared for use and in holding down production costs emphasize the need for this type of research. Adequate basic and applied studies involving the life history of important weed crops, the development of effective control measures, and the effects of long-time use of chemicals in the soil and on the metabolic activity of the crops grown should be accelerated.

Nematode Control. A wide variety of nematodes parasitize root systems of many important horticultural crops, resulting in heavy annual losses. We strongly urge that additional research funds be made available to investigate and expand present investigations on the control and eradication of nematodes and that these investigations include all the possible methods, including the use of chemical, biological, physical, physiological, genetic, and other methods of control, including chemosterilants. Methods should be developed for suppressing nematode damage and for determining the interrelationships with other organisms, such as viruses and fungi. In addition to the crops presently under study, we would recommend that grapes, citrus, sugar beets, cabbage and related crops, potatoes, onions, garlic, flowers, ornamentals, and shade trees be included in the investigations. There is definite need for expanded studies on the biology of nematodes, with special emphasis on classification, physiology, reproduction, the mechanism of pathogenic action in plants, and the nature of resistance and tolerance of plants to nematode damage. The increased emphasis on interstate quarantines requires that additional research on the control of these organisms in the soil and on the roots of plants is absolutely necessary.

Control of Insects. The Committee highly recommends the continuation of research to seek both practical and theoretical solutions to insect problems. The eradication of certain pests such as the silverworm, melon fruitfly, and Mediterranean fruitfly in certain areas has indicated the practicability of the sterile male and sex attractant techniques. Proposed extension of these techniques to the codling moth in the northwest and the cabbage looper in California could prove to be major breakthroughs in commodities of great importance to this Committee. The effort on non-chemical control, including sterility, attractants, insect predators, predatory diseases, and pathogens needs to be extended to include all the insect pests of horticultural crops.

Research in entomological and biological solutions to pest problems should be closely coordinated with chemical control studies. The developing resistance of certain species of insects to insecticides with established residue tolerances will undoubtedly create intolerable situations before biological techniques can bring about economic control. The continued development and testing of chemicals for insect and pest control is necessary to the maintenance of current production and quality levels. The effects of insecticide residues, both short and long term, require further evaluation.

Improved Mechanization Techniques and Equipment. The urgency of need for mechanical substitutes for human labor has been emphasized by the termination of Public Law 78. There are not enough people willing to do the required work. Time is a critical factor if we are to maintain the flow of high quality, adequate food supplies for our nation and the world. We emphasize the need for expanded research and development of practical devices to plant, grow, harvest, transport, process, package, and deliver every type of horticultural crop.

The development of vegetables, adaptable to mechanical harvest and the development of equipment for mechanical harvesting and for precision planting of vegetables should be given high priority.

Work should be expanded in cooperation with the University of California and the University of Arizona to develop a lettuce harvester. Particular attention should be given to the method of orienting cut heads and the method of trimming following orientation. A mechanical device also is needed to scan leafy vegetables for both surface and internal defects such as tip burn, decay, or mold.

As most of the research on potato harvesters has been and is continuing on machines adapted to stone free soils, there is an urgent need to develop a mechanical harvester for stony and cloddy soils of the old established areas that have been producing potatoes for many years. These areas have numerous production and marketing advantages, but, with the decreasing availability of hand labor, they will be forced to greatly curtail production unless a harvester is developed for their soil conditions. The Committee recommends that research be initiated immediately on this problem.

There also is definite need for research involving the protection of tree fruits from frost damage. The introduction of smaller-than-standard trees to ease harvesting problems creates some complications in frost prevention which demand investigation of orchard heating techniques and equipment and recommendations to the industry.

NUTRITION, CONSUMER AND INDUSTRIAL USE RESEARCH

Human Nutrition and Consumer Use Research. The Committee feels that a strong program of consumer-oriented food and nutrition research within the Department is vital to all aspects of agriculture and may greatly strengthen the image of agriculture and agricultural research. It urges continued support for the basic research now underway which seeks to establish nutrient needs of the individual and the foods, food qualities, and diet patterns which can meet these needs. At the same time, it appears most timely that the provocative findings from animal experimentation now be related directly to humans by expanding the nutrition research using human subjects.

In recommending further support for needed research in human nutrition, we recognize that this can only be effected if adequate facilities are available. The Committee notes that the activities of the Human Nutrition Research Division are presently dispersed among four separate facilities in the Beltsville area, and that none of these provides space for nutrition experiments with human subjects. We recommend that the Department give priority to construction of a centralized research facility at Beltsville to house these important food and nutrition activities and to provide for adequate coordination and development of the projected research program.

The Committee is pleased to note that the revised Agriculture Handbook 8, "Tables of Food Composition," has now been issued. This valuable and authoritative compilation fills a diverse need and should be kept current and complete. A vigorous program of multiple-nutrient analysis of new foods and new forms of foods now in the market is a necessary accompaniment.

The nationwide survey of food consumption practices of families and individuals now getting underway will serve a most useful purpose to all segments of agriculture and to workers in government, university, and industry concerned with aspects of food or nutrition. We consider it urgent that adequate funding be assured for prompt tabulation and statistical treatment and publication of the survey data.

The Committee also recommends extension of the food consumption survey to include several important studies in depth where our knowledge of eating patterns and their nutritional implications continues to be limited. One of these is a study of away-from-home institutional or quantity food service and its relative contribution to food consumption by families or individuals. Away-from-home feeding is estimated to be a \$20 billion segment of the Nation's food bill; it merits intensive study to achieve a balanced picture of food consumption practices and the nutritional adequacy of diets in this country. Another study which we feel merits strong support is the study of food consumption within various population groups.

Utilization Research and Development. It is gratifying to the Committee to note that facilities are being increased for the conduct of utilization research and recommends an expansion in personnel and support so that new facilities being planned and under construction will be completely utilized.

In general, this Committee concurs in the utilization research programs as outlined and presented for horticultural crops. It wishes to stress the importance of adequate research efforts and to restate our recommendations of last year which were not implemented and to indicate a number of problem areas which have developed or grown in importance since then.

Chemical Composition and Physical Properties. A knowledge of the chemical composition of horticultural crops is needed as a basis for the development of new and improved products and in the improvement of processing technology. Research should be expanded on major and minor constituents, the physical structure and properties, and the chemical and physical changes that occur in the maturing and processing of horticultural crops. Immediate emphasis is needed on (1) chemical constituents responsible for flavor, color, aroma, texture, and nutritive value; (2) the nature of chemical changes these substances undergo resulting from pretreatment, processing, and handling that lead to the formation of off-flavors, colors, and odors and of objectionable texture; (3) the determination of physiological activity of components through the use of laboratory animals; (4) the elucidation of enzymes in fruits and vegetables and their activity in changing constituents involved in color, texture, and other quality attributes; and (5) the chemical mechanisms involved in processing fruits and vegetables that affect stability of processed products.

New and Improved Food Products. The rapidly changing tastes of the consuming public require the continuing development of food products of convenience and high-level acceptability in order to retain traditional and develop new markets. Greatly increased costs of transporting, storing, and handling are making it more economical to market concentrated, dehydrated, and other processed foods. Population expansion and improving economy in many sections of the world give rise to a new opportunity for exportation of high-quality products. Research should be expanded to develop desirable and stable products of (1) citrus, avocado, papaya and other tropical and subtropical fruits; (2) apple, cherry, and other deciduous fruit products as liquid concentrates, semi-solid, quick-cooking, dehydrated pieces, and powdered forms; (3) fresh potatoes or from stable intermediates, such as dehydrated and dehydrofrozen products, including flakes, granules, quick-cooking potato dice and other pieces, and nutritious low-fat, potato-containing dietary foods, for domestic and export markets; and (4) other vegetables, including dry beans, peas, green leafy vegetables, sweet corn, sweet potatoes, tomatoes, carrots, celery, okra, and cucurbits.

Improved Processing Methods and Equipment. Continuous developmental research is necessary to improve processing efficiency and develop equipment and processes that enhance product acceptability, stability, and other quality factors. Chemical and physical concepts and engineering aspects of all processes must be continuously evaluated in the light of basic research findings to reduce processing costs and improve product quality.

Both basic and applied research should be expanded and directed towards (1) reducing the severe conditions required to inactivate spores of food spoilage organisms during heat sterilization; (2) reducing the adverse color and texture changes that occur as a result of freezing and dehydration operations including studies on the effects of rate of freezing on texture of frozen foods; (3) controlling processes to produce uniformly high-quality products from raw material that is variable because of the varietal selection and the effects of agronomic and harvesting practices in production; (4) developing processes for utilizing products of excellent food quality but unfitted for fresh markets because of size, shape, or other non-harmful physical condition; (5) developing new drying and concentration techniques, such as by explosion drying, sugar osmosis drying, and concentration by osmosis and reverse-osmosis; and (6) developing instruments and techniques for the objective measurement and control of quality of products as required to develop successful processing operations. Additional research is needed on many specific commodity problems including the following: eliminating or modifying the bitterness of grapefruit and navel orange products; enhancing stability of dehydrated and frozen fruit products and shelled nuts; improving the texture of frozen fruits and vegetables, including strawberries and green beans; reducing the amount of additives required in dried fruits to better suit the export markets; improving quality and reducing the cost of freeze-dried products; developing specific commodity technology for the application of dehydrofreezing and foam-mat drying to a wide range of fruit and vegetable products; improving processing methods to better retain the fresh flavor and texture quality for potato products; and improving the texture and color of vegetables preserved by fermentation, especially cucumber pickles.

Characterization and Control of Quality of Raw Materials for Processing.

The quality of fruit and vegetable products is dependent upon the raw material processed. Because of the increasing proportion of fruits and vegetables being marketed in processed form, it is imperative that new varieties be evaluated for their suitability for processing as well as for their fresh market characteristics. Adaptability of specific fruits and vegetables for processing is dependent upon the area where they are grown. Existing shortages of harvesting labor are forcing a rapid development in the mechanization of harvesting of fruit and vegetable crops.

Research should be expanded in cooperation with plant breeders, agricultural engineers, and other scientists responsible for the development of improved varieties and selection for particular geographical areas, and with the engineers and others developing new harvest procedures, to evaluate established varieties in plant breeders lines and new agronomic and harvesting methods for the processing characteristics of fruits and vegetables of such experimentation. Particular attention should be given at this time to the immediate needs for crash development of mechanical harvesting equipment and its relationship to the processing quality of fruits or vegetables so harvested. Attention is drawn to the absolute necessity of conducting this type of research in field locations despite the general desirability of conducting agricultural research in large, specialized laboratories or research facilities.

Prevention of Microbial Deterioration. Processors of horticultural crops encounter considerable losses through microbial deterioration and spoilage prior to and during processing and in the channels of trade. Rapid changes in the marketing of fruits and vegetables have brought about many new products and processes. The possible hazards related to new process and product developments from microbial contamination provide a critical area requiring an expansion in research efforts. Existing research in this field should be expanded to develop procedures for eliminating losses of product by microbial deterioration and new research initiated to evaluate hazards of microbial contamination and to develop means for its control.

MARKETING AND ECONOMIC RESEARCH

The Committee endorses the USDA research progress and plans as presented and discussed at the meeting and urges consideration of the following additional specific projects:

Packaging Apples. The apple industry is pre-packaging a greater percentage of its production each year. There is a need for container research to develop a master shipping carton for bagged apples. This container must be capable of adaptability to a variety of bag sizes and delivering a high net weight in desirable condition. It needs to be strong enough to prevent sagging when high-stacked on pallets and designed to dimensions which facilitate car loading and efficient shipment.

Packaging Fresh Apricots and Prunes. Northwest apricots and prunes are seriously affected by the lack of market-accepted shipping containers which are not excessively expensive for the commodity involved. There is a need and a request for container research which will develop packages for these commodities more in line with present day marketing and transportation methods.

Potato Chip Color Standards. The Committee recommends that research be expanded to develop a color chart for potato chips, which will show gradation of chip color from light to dark. Such a chart may then be used as a basis for color specification in contracts between grower and chipper. In addition to having a color chart, there is also a need for research to develop a simple yet satisfactory instrument and technique for objectively measuring color of chips so such a color determination may become a part of the Federal grade standards.

Marketing Floricultural Crops. The Committee recognizes the contributions made by the Florists Telegraph Delivery Association and its foresight in sponsoring economic research on floral products in the Department. It urges that the Department strengthen this research with appropriated funds on a continuing basis. It is of utmost importance that crop reporting on major cut flower crops be continued beyond the pilot stage. Additional States and crops should be included.

Foreign Markets. The European Common Market has had variable and often profound effect upon some American agricultural products. We believe that additional effort should be made to assist producers, processors, and marketers to understand the actions and the impact of the Common Market.

The largest potential market is for American fruits and vegetables overseas. Strengthened, export-oriented research by Market Quality Research and Transportation and Facilities Research Division also is urgently needed.

Research should be initiated on mild dry spring onions and fresh carrots to determine export requirements for packaging and handling, in an effort to expand foreign exports.

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